HLW & FD

EIS PROJECT - AR PF
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Rev2 EISreview

Comments on "Draft INEEL HLW EIS, Idaho High-Level Waste & Facilities Disposition"

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What was said and done at the 7Feb00 Idaho Falls public hearing on the "Draft INEEL HLW EIS" has inspired a revision of my original review. Here it is:

9-1 IX.A(2) Thanks for asking for my opinions of your "Draft INEEL HLW EIS". It's nice to see that the effort I've put into my hobby (HLW management) qualifies me to be one of the Site's "key stakeholders". Since the National Academy of Science's (NAS's) Board on Radioactive Waste Management seems to feel the same way (they've sent me a personal copy of their review of the Site's HLW program), I've decided to put my thoughts about both of these reports together into one note.

Since the NAS's report is apt to have greater impact on INEEL's future, I'll start off with it.

9-2 X1(3) I sympathize with the NAS Panel's frustration with the DOE management "symptoms" that make doing nothing seem more sensible than trying to implement any of the EIS alternatives consistent with today's HLW management paradigm. (These symptoms are identified in another recent NAS Report, *"Barriers to Science"*, 1996.) However, while I agree with that Panel's reservations about the management approach championed by INEEL's decision-makers (separations/vitrification), I don't agree with its conclusion that it would be best to abrogate the two main provisions of the "Batt agreement"; i.e., to not render existing calcines "road ready" by 2035 AD and to not calcine the remaining liquid waste by 2012 AD.

Since DOE could honor its promises if it were simply willing to eschew some of its "symptoms", a more constructive conclusion would have been to suggest that it do so and identify specific changes that need to be made.

I also disagree with the Panel's rationalizations for its conclusions. First, it is *not* necessary to delay decision-making until we know more than we do already about the chemical composition of INTEC wastes[1] - today's uncertainties have to do with traces of materials of significance only to the waste's classification, not to implementing its solidification. Second, it is *not* necessary for INEEL to know every conceivable detail about the waste's ultimate resting place (repository) to keep its promise (convert its waste to transportable monoliths). It can and should make waste form materials suitable for disposal in any of the already sufficiently-characterized & technically competent potential repository sites available to the US Federal government - the same assumption made by the people who designed the "historic waste" solidification system at the UK's new fuel reprocessing facility at Sellafield, Cumbria[2].

9-65 III.E(2)

[1] Because the amount and chemical composition of the wastes put into the tanks/binsets was both known and recorded, we already know everything genuinely relevant to implementing any of several candidate rock-making processes.

[2] In 1982, the British government directed its prime nuclear contractor, British Nuclear Fuels, Limited (BNFL), to design an up-to-date commercial fuel recycling facility at Sellafield (aka Windscale). It mandated that the new facility must not only be able to immediately process all newly-generated reprocessing wastes to disposable waste forms, but also to similarly deal with a 30 year backlog of "temporarily" stored reprocessing waste generated before. Unlike the situation here in the USA, the British government did not impose a "preferred technology" - only that finished waste forms must satisfy performance based standards; i.e., be suitable for disposal in any of the possible repository systems that it might choose to implement within the next 50 years or so. Five years worth of collaborative effort

9-66 III.D.1(2)

EXHIBIT #1
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9-3 V(3) In practice, much of the "characterization" now being done in the DOE complex is unnecessary. It's popular with decision-makers because it provides them with another excuse for putting off politically tough decisions and/or substantive actions while continuing to spend "programmatic" money. A properly designed and implemented waste management system is "rugged" enough to work with a substantial degree of uncertainty in its feedstream[3].

9-4 X1(4)

9-5 X(3) What we genuinely don't know enough about yet are specific details of how to go about applying alternative treatment/solidification technologies to INEEL's wastes. The reason for this is that DOE-ID has refused to insist that its M&O contractor spend "programmatic" money on actual R&D - virtually all the money spent on alternatives to its pet separation/vitrification-based scheme went to produce "group think" exercises similar to today's Draft HLW EIS.

9-67 III.D.1(4)

9-6 V(6) There is an important factual error in the NAS report (it isn't the Panel's fault – it was pulled verbatim out of an INEEL technical publication.) Figure 11.1 (p 99) suggests that ICPP/INTEC calcines are about ten times more radioactive than they really are (i.e., that they possess a total radioactivity of about 60,000 curies/m^3.). In this case, the number is important because it suggests that it would take more than one hundred years for those calcines to decay down to a level now considered to be "low". The fact is that typical ICPP/INTEC calcines generate only about 40 watts worth of radioactive heat/m^3 (due primarily to ^{90}Sr & ^{137}Cs) which corresponds to a radioactivity of ~7,000 Ci/m^3 - which, in turn, means that they're about at "Class C" LLW limits now & definitely will be below them (fission-product-wise at least,) by the time that we've promised to have 'em ready to be shipped offsite.

9-7 V(9) Of course, in a more rational environment it really wouldn't make much difference exactly how "hot" these wastes are because any facility built to treat/dispose of them would certainly be "remoted" anyway - where specific numbers make a difference is when decision-makers decide what they are going to do based solely upon arbitrary (and therefore subject to change) criteria such as the radwaste classification numbers listed in Table II of 10 CFR 61. DOE's infatuation with legalistic hair-splitting ("classification") rather than common-sense implementation of the intent of regulations (another of its "symptoms") is evinced by INEEL's insistence that SBW is fundamentally different than the reprocessing waste that's already been calcined . If/when we ever screw up enough resolve to calcine SBW, we'll discover that the product is just as nasty as the other calcines - it'll have a higher percentage of plutonium, less fission products, more mercury, less cadmium, etc., etc.. The fact that somebody decided to label one of them "high" and the other "incidental" does not constitute a valid reason to treat them differently. They should be turned into one type of waste form and disposed of in one repository.

The NAS apparently wasn't told that there's enough room in the binsets (set #7) to accept any calcine made from SBW without having to mix it with existing calcines and thereby render it "high". That's

9-66 III.D.1(2) (cont'd) by technologists from BNFL and the British Government's Department of Environment led to a consensus that "inorganic cements" would be appropriate for all radwaste streams generating less than ~500 watt/m^3 worth of radioactive heat; i.e., in England the choice of solidification technology is determined by a measurable and technically relevant characteristic of the waste - its history and any arbitrary labels that may have been applied to it in the past (e.g., "high-level", "low-level", "mixed", "incidental", "transuranic", etc.) don't matter. This conclusion is consistent with sound technical and economic reasoning, IAEA guidelines, and the opinions of US technologists willing to assume the professional risks inherent in taking an unblindered look at the issue. By 1991, BNFL had completed the new reprocessing plant and its cementitious solidification facilities started "hot" operation two years later - it has since converted Sellafield's >15,000 m^3 accumulation of historic reprocessing waste (~150 distinguishable "streams") to 500-liter stainless steel canisters filled with concrete.

[3] US taxpayers are now paying their government ~$60,000 (roughly the cost of a four-year degree at a good college) to "characterize" individual barrels of waste being prepared for shipment from INEEL's RWMC to WIPP. The nominal purpose of this activity is to "assign codes" to the waste – the actual analyte concentrations so-determined do not determine how the barrel is shipped or what will be done with it at the repository.

[4] For instance, a "rugged" grout-based solidification system for liquid waste would assume that the waste was "mixed", not over-emphasize waste loading, and incorporate a calcination/incineration pretreatment step. The reason for the latter is that "devolatilization" (which includes denitration) of liquid waste reduces the mass/volume of grout that will have to be made/stored/transported, destroys organics (including things like "listed" wastes and chelating agents), and invariably produces a final product with superior leach resistance. (Unfortunately, most DOE grout is made from uncalcined wastes).

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important because one of its rationalizations for recommending that DOE-ID break its promise to calcine SBW (which wouldn't be good for INEEL's credibility) is that so-causing it to become "high" would make it more difficult to deal with. It wouldn't, making any kind of durable "rock" out of SBW (concrete, HIPed glass-ceramic, or glass) would be facilitated by first burning out the volatile stuff.

Now, let's turn to the EIS itself.

9-8 VII.D(6) 9-9 III.C(1) 9-10 III.C(1) DOE has promised to calcine **all** of INEEL's reprocessing waste, doing so would simplify its conversion to good-quality waste forms, and *it can* be done on time (by 2012 AD) for a reasonable number of axdollars – why does this EIS devote so little attention to ways of actually accomplishing it?

9-11 III.C(2)

9-12 III.C(2) The "technical" reason that INEEL has managed to calcine only about 10% of its SBW during the last eight years is that its decision-makers deliberately decided to **not** use the only efficient approach available to do it; i.e., add some sugar to the waste just before squirting it into the calciner. This is a well-established and safe way to calcine SBW.[5] If you arbitrarily reject it (today's excuse is "safety") then you either have to dilute the SBW with massive amounts of easily-denitrated stuff such as aluminum nitrate - which makes the calcination process extremely slow, unnecessarily "NOx ous", and creates a lot more calcine than we need to – and/or run the calciner at a temperature that generates so much "fines" that its offgas system eventually plugs up with dust (the reason why the last "high temperature" calcination campaign had to be terminated). The fact that our decision-makers have also refused to do such things as recover/recycle mercury (electroplate it from the offgas scrub solution) and NO_x (via water-scrubing) from the calciner's offgas has made calcination much less attractive to INEEL's stakeholders (& that mission less viable) than it ought to be. Some modifications to NWCF would cost a lot of money but these ought to be cheap.

9-13 III.C(2)

9-14 III.C(2) Since NO_x is the probably the most toxic gas emitted by NWCF (& certainly the most visible one), don't you think that an EIS ought to mention that there's a cheap way to ameliorate the situation? [Cheap? @ 20 cents/pound, enough table-quality sugar to sugar-calcine all SBW would cost about $0.5 million – "running" NWCF costs ~$50 million/year & sugar-calcination would cut the required operational time by at least a factor of two.]

9-15 III.C(2) There are two reasons why sugar calcination would significantly reduce (probably by a factor of more than ten) the amount of NO_x emitted by NWCF. First, much less "cold" aluminum nitrate would have to be added to the waste (we'd need an Al:Na ratio of ~1:1 instead of the ~3:1 required by the "basis approach" – each mole of Al so-added adds another three moles of nitrate). Second, sugar calcination reduces most of the nitrate in the feed to harmless elemental nitrogen, not NO_x.

9-16 III.D.4(7) Since the NAS Panel apparently agrees with me that homogenizing INEEL's radwastes would facilitate the implementation of any subsequent waste form-making process, why isn't the waste coprocessing alternative that I suggested six years ago (i.e., slurry SBW with existing calcines, add some sugar, and then feed both phases into NWCF – immediately "grout" the new calcine) seriously considered in this EIS? It was certainly deemed feasible by Fluor Daniel (1996). The University of North Dakota's fluidized bed combustion research facility ("*Energy & Environmental Research Center*") offered to do a pilot plant scale demonstration for us for a nominal sum. So did *STUDSVIK*. Why didn't we look into it?

9-17 III.D.4(4) Why doesn't this EIS mention that *STUDSVIK* also offered to sell INEEL a brand new, already MACT-compatible SBW calcination system (including a building to put it in) for considerably less than what it's now spending every year trying to "run" NWCF?

[5] The rest of the world (e.g. BNFL at Sellafield) routinely sugar calcines SBW & we successfully tested it in our own fluidized bed calcination pilot plants here at NRTS/INEL/INEEL thirty-five years ago and again ~ 3-4 years ago. In 1995, a Hanford contractor, VECTRA, had one of its subcontractors, Procedyne, "reinvent" fluidized-bed sugar calcination of SBW. For some reason, none of those "pro-sugar" reports were cited in INEEL's recent review of SBW calcination options (H. J. Welland, LMITCO INTERNAL REPORT, "NWCF Process Modification for Sodium Bearing Waste Project Conceptual Design,", INEL/INT-97-00075, dated April 1997.)

(3)

Incidentally, I've just heard through the company grapevine that most of BBWI's radwaste experts have been cloistered up in town for the last 3-4 weeks trying to decide upon a way of dealing with SBW consistent with all of DOE's customs/policies/assumptions – apparently someone's pushing for a decision on a "preferred alternative".

9-19 III.F.3(1) I've also heard that the SBW treatment being viewed with the most favor invokes running it through centrifugal contactors to separate it into streams labeledl called "non-contact handled TRU" and "Class C" LLW, grouting both of 'em, and then shipping both off to be buried in differently-labeled holes at WIPP. Apparently, somebody's decided that there's only so much "room" for one of these waste categories at WIPP (I forget which one) so it would, therefore, make good sense for us to spend a few tens (hundreds?) of million taxdollars separating the stuff before we ship it all off to the same place.

9-20 III.D.4(7) Again, according to the grapevine, none of the NAS report's suggested SBW treatment options are being considered. Why not?

Here are some questions/comments about how the alternatives are represented in the EIS.

9-21 III.C(9) First, most of your process options invoke the grouting of one or more liquid waste streams – most of which would be strongly acidic. None of the figures you've shown depict that those streams will be calcined/incinerated prior to being solidified.[6] Why not? Are you hoping that "declassification" will make the manufacture of top-quality concrete unnecessary?

9-22 III.D.2.a(1) Second, your Hot Isostatic Pressed (HIP) Waste option (Fig. S-9) invokes the HIPing of ion exchange resin. You can't put gas-forming materials into HIP cans. The figure needs to indicate some sort of heat-pretreatment step.

9-23 III.D.3(4) Third, your "Planning Basis" (Fig. S-7) and "Minimum INEEL Processing alternatives (S-12) suggest that Cs-loaded ion exchange resin will be "separated" along with the calcines. Would a process designed to dissolve/extract calcines work with ion exchange resins? Wouldn't it be better to burn those resins and treat the *ash*? If that's to be done, your figures should depict the required incinerator. Ditto that for all of the "separation" alternatives.

9-24 IX.A(8) In general, it would appear that all of the figures depicting the various separations-based treatment alternatives are greatly simplified relative to that representing "direct cement"; i.e., a considerably higher fraction of the unit operations required to implement them have been left out.

Next, let's discuss the management scenarios that I've had some hand in bringing to the Public's attention - all those that would convert stuff now considered "high" into concrete.

9-25 III.D.2.b(4) First, I'm disappointed that the folks you've hired to produce this EIS have somehow managed to conclude that the "direct cement" option - turning a pile of sand-like calcine into cans full of "rock" by mixing it with cementing agents & water, injecting that grout into steel canisters, and then curing it/them in a pressure cooker (which step might not even be necessary - only some hands-on research can really tell) - would be as "dangerous" as your M&O Contractor's pet separations-based "Planning Approach"- which of course, would require far more unit operations, more time, more people, (a lot) more toxic chemicals, much higher (>2000 F) processing temperatures, multiple waste forms, an extra incinerator, transport to multiple repositories, etc., etc..

9-26 X(4) Second, I was also disappointed to discover at last night's (7Feb00) Public Hearing that DOE and its contractors have persisted in artificially inflating the cost of the "direct cement alternative" by saddling it with a ridiculously high volumetric disposal cost - a figure which has risen from the ~$300,000/$m^3$ assumed five years ago to today's even more fantastic $850,000/$m^3$. Here's why this is both irrelevant

[6] A description of one alternative did suggest that its LLW would be "denitrated" before grouting. No indication of how that might be accomplished was given.

(4)